CHAPTER 4

SUBBASE COURSE

4-1. General. Suitable borrow material or other processed or stabilized material should be used between the subgrade and base to make up the pavement section. These layers are designated the subbase course.

4-2. Material source. Investigations and tests described in chapter 2 should be used to determine the location of suitable material for use as subbase. (See table 4-1 for test methods for subbase and base materials.) For mobilization conditions, material quality certification can be used to replace initial testing, especially in the case of local existing stockpiles, pits, or quarries.

4-3. Suitable materials. Subbase material can consist of the following:

- Naturally occurring coarse grained materials:

  Uncrushed gravel and sand
  Well-graded sands
  Disintegrated granite

- Special and processed material:

Limerock	Quarry and nonhazardous mine waste
Coral	Slag
Caliche	Sand-shell mixtures
Crushed stone or gravel	

- Blends of natural or processed materials. Subgrade materials used for blending should meet the requirements for liquid limit and plasticity index prior to mixing.

- Stabilized materials: See EM 1110-3-137.

a. Selection of design CBR for subbase. Determine the CBR value of the subbase from methods described in MIL-STD-621, Test Method 101. If the CBR exceeds the maximum permissible values, use the value shown in table 4-2.

Table 4-1. Test Methods for Subbase and Base

Test	Test Standard ASTM	AASHTO	MIL-STD-621 Test Method
Sampling materials	D 75	T 2	
Unit weight of aggregate	C 29	T 19	
Soundness test	C 88	T 104	
Abrasion resistance by Los Angeles machine	C 131	T 96	
Sieve analysis	C 136	T 27	
Amount finer than No. 200 sieve	C 117		
Particle-sized analysis of soils	D 422	T 88	
Liquid limit	D 423[1]	T 89[1]	103
Plastic limit	D 424	T 90	103
In-place density and moisture content[2]	D 1556	T 191	
Moisture-density relations of soils	D 1557		100 (CE 55)
Remolded CBR test	D 1883		101
In-place CBR test			101
Sand equivalent	D 2419	T 176	
Compressive strength-soil cement	D 1633		
Moisture density-soil cement[3]	D 558	T 134	
Wet-dry tests - soil cement	D 559	T 135	
Freeze-thaw tests - soil cement	D 560	T 136	

[1]Use the 3 point "flow curve" method.

[2]See table 2-3 for alternative methods.

[3]Modified to require five layers, a 10-pound rammer and an 18-inch drop.

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Table 4-2. Maximum Permissible Values for Unbound Subbase

Material	Maximum Requirements Design CBR	Maximum Values Gradation Size (in.)	Percent Passing No. 10	Percent Passing No. 200	Liquid Limit	Plasticity Index
Subbase	50	3	50	15	25	5
Subbase	40	3	80	15	25	5
Subbase	30	3	100	15	25	5
Subbase	20	3	-	25[1]	35[1]	12[1]

[1]Suggested limits.

b. Design example. An example of design CBR determination for a sample of gravelly sand follows:

Soaked CBR	41
Maximum size, inches	0.5
Percent passing No. 10 sieve	85
Percent passing No. 200 sieve	14
Liquid limit	12
Plasticity index	3

The design CBR for this material is 30 because 80 percent passing the No. 10 sieve is the maximum permitted for higher CBR values and this material has 85 percent passing.

c. Exceptions to gradation requirements. Cases may occur in which certain natural materials that do not meet gradation requirements may develop satisfactory CBR values in the prototype. Exceptions to the gradation requirements are permissible when supported by adequate in-place CBR tests on similar construction that has been in service for several years.

4-4. Additional requirements.

a. Subbase thickness. Determine required thickness of subbase as outlined in chapter 7. If less than 6 inches of subbase is required, consider increasing the thickness of base course.

b. Density requirement. Compact subbase to 100 percent of maximum density.

c. Frost susceptibility. In areas where frost penetration is a problem, consult criteria in EM 1110-3-138.

d. Expansive material. Do nct use material which has a swell of 3 percent or greater, as determined from the CBR mold, for subbase.